REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
M	Changes IAW NOR 5962-R195-93, 5962-R266-94, and 5962-R102-96. Entire document redrawn.	96-08-02	R. MONNIN

CURRENT CAGE CODE 67268

REV																			
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REV STATUS OF SHEETS	REV	M	M	M	M	M	M	M	M						
	SHEET	1	2	3	4	5	6	7	8						

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

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DRAWING APPROVAL DATE
80-12-22

REVISION LEVEL
M

DEFENSE SUPPLY CENTER COLUMBUS
COLUMBUS, OHIO 43216

MICROCIRCUIT, HYBRID, OPERATIONAL AMPLIFIER, THICK FILM

SIZE	CAGE CODE	
A	**14933**	**80013**

SHEET 1 OF 8

DESC FORM 193
JUL 94

5962-E494-96

1. SCOPE

1.1 Scope. This drawing describes device requirements for class H hybrid microcircuits to be processed in accordance with MIL-PRF-38534.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:

80013	01	Z	X
Drawing number	Device type (see 1.2.1)	Case outline (see 1.2.2)	Lead finish (see 1.2.3)

1.2.1 Device type(s). The device type(s) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	0032	Operational amplifier

1.2.2 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
Z	See figure 1	12	Can

1.2.3 Lead finish. The lead finish shall be as specified in MIL-PRF-38534. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Supply voltage range . . . . . ±18 V dc maximum
Input voltage range . . . . . ±18 V dc
Maximum power dissipation (P_D), T_A = +25°C . . . . . 1.5 W 1/ 2/
Storage temperature range . . . . . -65°C to +150°C
Lead temperature (soldering, 10 seconds) . . . . . +300°C
Junction temperature (T_J) . . . . . +150°C

1.4 Recommended operating conditions.

Supply voltage (V_S) . . . . . ±15 V dc
Ambient operating temperature range (T_A) . . . . . -55°C to +125°C

1/ No heat sink.
2/ Derate at 10 mW per °C.

2. APPLICABLE DOCUMENTS

2.1 Government specification and standards. Unless otherwise specified, the following specification and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

PERFORMANCE

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-973 - Configuration Management.
MIL-STD-1835 - Microcircuit Case Outlines.

(Copies of the specification and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38534 and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking. Marking shall be in accordance with MIL-PRF-38534. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in QML-38534 (see 6.6 herein).

3.6 Manufacturer eligibility. In addition to the general requirements of MIL-PRF-38534, the manufacturer of the part described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, produced on the certified line, for each device type listed herein. The data should also include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in QML-38534 (see 6.6 herein). The certificate of compliance submitted to DSCC-VA prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38534 and the requirements herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Preseal burn-in test, method 1030 of MIL-STD-883.

(1) Test condition C or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1030 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

c. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 10, and 11 shall be omitted.

4.3.2 Group B inspection. Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection. Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.7 herein).

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

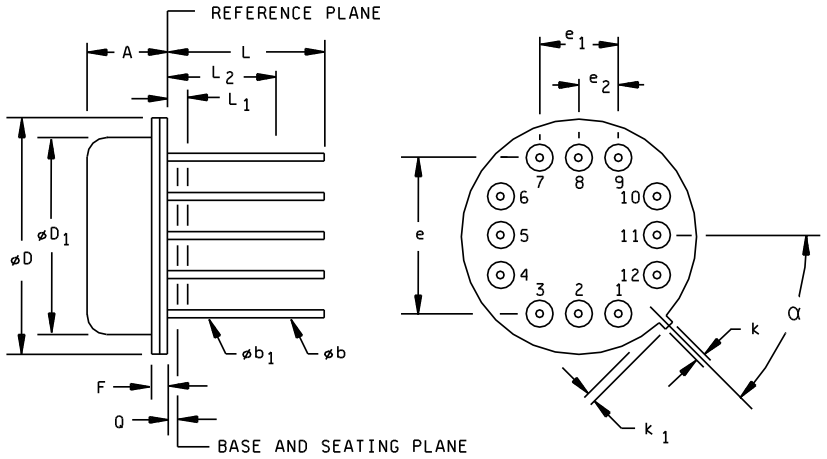
(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection. Group D inspection shall be in accordance with MIL-PRF-38534.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device Type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}	R_L = 100 kΩ, V_{IN} = 0 V	1	01		5.0	mV
			2,3			10.0	
Input voltage range	V_{CM}		1,2,3	01	±10		V
Input offset current	I_{IO}	V_{IN} = 0 V	1	01		0.025	nA
			2,3			25	
Input bias current	I_{IB}	V_{IN} = 0 V	1	01		0.1	nA
			2,3			50	
Supply current	I_{CC}	I_O = 0 mA, T_A = +25°C	1	01		20	mA
Supply voltage rejection ratios	SVRR(±)	±5 V ≤ V_S ≤ ±20 V	4,5,6	01	50		dB
Large signal voltage gain	$A_{VS(±)}$	R_L = 1 kΩ, V_{OUT} = ±10 V	4	01	48		dB
			5, 6		45		
Input voltage common-mode rejection ratio	CMRR	$\triangle V_{IN}$ = ±10 V	4,5,6	01	50		dB
Input offset voltage temperature coefficient	$\triangle V/\triangle T$		1,2,3	01		50	µV/°C
Output voltage swing (maximum)	V_{OP}	R_L = 1 kΩ	1,2,3	01	±10		V
Voltage gain	A_V	R_L = 1 kΩ, V_{OUT} = ±10 V, f = 1 kHz	4,5,6	01	57		dB
Slew rate	SR	R_L = 1 kΩ, A_V = +1, $\triangle V_{IN}$ = 20 V, T_A = +25°C	4	01	350		V/µs
Small signal rise time	t_r	A_V = +1, R_L = 1 kΩ, T_A = +25°C	9	01		20	ns
Small signal delay time	t_d	A_V = +1, R_L = 1 kΩ, $\triangle V_{IN}$ = 1 V, T_A = +25°C	9	01		25	ns
Settling time to 1 percent of final value	t_{set}	A_V = -1, R_L = 1 kΩ, $\triangle V_{IN}$ = 20 V, T_A = +25°C	9	01		0.5	µs

1/ V_S = ±15.0 V dc.



Symbol	Inches		Millimeters		Notes		Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max				Min	Max	Min	Max	
A	.130	.181	3.30	4.60			F	.022	.030	0.56	0.76	
ϕb	.016	.019	0.41	0.48	2, 6		k	.026	.036	0.66	0.91	
ϕb_1	.016	.021	0.41	0.53	2, 6		k_1	.026	.036	0.66	0.91	3
ϕD	.595	.610	15.11	15.49			L	.500	.560	12.70	14.22	2
ϕD_1	.545	.555	13.84	15.37			L_1	----	.050	----	1.27	2
e	.400 BSC		10.16 BSC		4		L_2	.250	----	6.35	----	2
e_1	.200 BSC		5.08 BSC		4		Q	----	.045		1.14	
e_2	.100 BSC		2.54 BSC		4		α	45° BSC		45° BSC		

NOTES:
1. The US government preferred system of measurement is the metric SI system. However, this item was originally designed using inch-pound units of measurement. In the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
2. All leads ϕb applies between L_1 and L_2. ϕb_1 applies between L_2 and .500 (12.70 mm) from the reference plane. Diameter is uncontrolled in L_1 and beyond .500 (12.70 mm) from the reference plane.
3. Measured from the maximum diameter of the product.
4. Leads having a maximum diameter .019 (0.48 mm) measured in gauging plane .054 (1.37 mm) + .001 (0.03 mm) - .000 (0.00 mm) below the base plane of the product shall be within .007 (0.18 mm) of their true position relative to a maximum tab width.
5. The product may be measured by direct methods or by gauge.
6. All leads: Increase maximum limit by .003 (0.08 mm) when lead finish A is applied.

FIGURE 1. Case outline Z.

Device type	01
Case outline	Z
Terminal number	Terminal symbol
1	No connection
2	Output compensation
3	Balance/compensation
4	Balance/compensation
5	Inverting input
6	Noninverting input
7	No connection
8	No connection
9	No connection
10	$-V_S$
11	Output
12	$+V_S$

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	-------
Final electrical test parameters	1*, 2, 3
Group A test requirements	1, 2, 3, 4, 5, 6, 9
Groups C end-point electrical parameters	1, 2, 3

* PDA applies to subgroup 1.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0525.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-0676.

6.6 Approved sources of supply. Approved sources of supply are listed in QML-38534. Additional sources will be added to QML-38534 as they become available. The vendors listed in QML-38534 have agreed to this drawing and a certificate of compliance (see 3.7 herein) has been submitted to and accepted by DSCC-VA.

STANDARD MICROCIRCUIT DRAWING SOURCE APPROVAL BULLETIN

DATE: 96-08-02

Approved sources of supply for SMD 80013 are listed below for immediate acquisition only and shall be added to QML-38534 during the next revision. QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This bulletin is superseded by the next dated revision of QML-38534.

Standard microcircuit drawing PIN	Vendor CAGE number	Vendor 1/ similar PIN
8001301ZA	23223	CTS0032ZB
8001301ZA	64762	ELH0032G/883B
8001301ZC	23223	CTS0032ZB
8001301ZC	64762	ELH0032G/883B
8001301ZC	51651	MSK0032B

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
23223	CTS Microelectronics 1201 Cumberland Avenue West Lafayette, IN 47906-1317
51651	M.S. Kennedy Corporation 8170 Thompson Road Circero, NY 13039-9393
64762	Elantec, Incorporated 1996 Tarob Court Milpitas, CA 95035-6824